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(54) Title: **DIAPHRAGM PUMP**

(57) Abstract: A diaphragm pump assembly including a control module for controlling the discharge and suction strokes of the diaphragm. The diaphragm pump includes a pump housing defining a pump chamber having a flexible diaphragm supported within the chamber that divides the chamber into a pumping chamber and a pumpage chamber. The pump control module controls the communication of pressurized fluid, i.e., air, to the pumping chamber. A fluid pressure operated actuator is attached to a housing or bracket that is also secured to the diaphragm housing. The actuator includes an actuating rod that extends into operative engagement with the diaphragm. A direction control valve selectively directs fluid pressure to the pumping chamber during a discharge stroke and to a retraction chamber forming part of the actuator during a suction stroke. An intermediate or detent valve controls the direction control valve. First and second end of stroke sensors sense the limits of movement for the actuating rod and apply pressure differential signals to the detent valve to shift an element within the detent valve between two positions. Shifting of the valve element in the detent valve produces attendant changes in state of the direction control valve. A pair of pressure regulators located downstream of the direction control valve and detent valve are used to adjust the fluid pressure applied to the diaphragm during a discharge stroke and the fluid pressure applied to the retraction chamber during a retraction stroke. A port is also provided for optionally feeding pressurized fluid to discharge stroke chamber forming part of the actuator whenever fluid pressure is applied to the pumping chamber.

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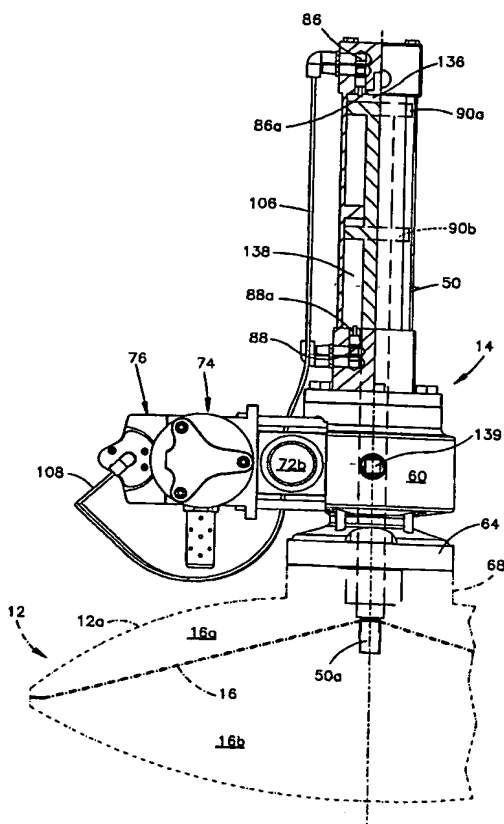
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[Continued on next page]

(54) Title: **DIAPHRAGM PUMP WITH CONTROL MODULE**



(57) Abstract: A diaphragm pump assembly including a control module (14) for controlling the discharge and suction strokes of the diaphragm (16). The diaphragm divides a pump chamber into pumping and suction chambers. The pump control module controls the communication of pressurized fluid to the pumping chamber. A fluid pressure operated actuator includes an actuating rod (50a) that connects to the diaphragm. A direction control valve (74) directs fluid pressure to the pumping chamber during a discharge and to an actuator retraction chamber during suction. An intermediate or detent valve controls a direction control valve. End of stroke sensors sense the actuating rod movement and apply pressure differential signals to the detent. Pressure regulators (72a, 72b) adjust the fluid pressure applied to the diaphragm during a discharge and the fluid pressure applied to the retraction chamber during retraction. An optional port feeds pressurized fluid to an actuator discharge stroke chamber during the discharge stroke.

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